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NORMAL GROWTH OF RANGE CATTLE

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LOCATION OF RANGE

In connection with the investigation of stock-poisoning plants carried on by the Bureau of Animal Industry, United States Department of Agriculture, at the Salina experiment station, near Salina, Utah, since 1915, considerable information regarding the normal gains in weight made by cattle on the summer range has been obtained. There is little previous definite information regarding the growth of animals under these conditions.

The Salina experiment station is situated on the Fishlake National Forest, in the Wasatch Mountains of Utah, at an altitude of approximately 8,000 feet. It is in a cattle and sheep range country, which is fairly typical of this part of Utah. In fact, the pastures are a portion of the cattle range fenced off for the station's use. The sheep and horse range joins it along one side. Aspen groves, oak ridges, and small meadows make up most of the area under fence.

The particular pasture which has been used for cattle has furnished ample forage for the number of animals kept in it, as is shown by the fact that the vegetation has improved from year to year since the station was established. Forage, too, is fully as varied as on the surrounding range. Water is ample at all times and of good quality.

ORIGIN AND MANAGEMENT OF THE CATTLE

Each year cattle have been obtained from local stockmen and placed in the pasture as early in the season as conditions would permit. In 1915 several different persons furnished animals, each lending a few head. Since then practically all the cattle have been

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furnished by one man, G. A. Christensen, of Redmond, Utah. All animals have been of native stock, raised in the general neighborhood of Salina. Their ages have varied from calves to 3 years or more, though most of them have been yearlings and 2-year-olds.

In this general portion of Utah cattle are run on the higher ranges during summer months, and in the winter are kept in the valleys, most of them being held in pastures and fed during periods of bad weather. During the winter months no attempt is made to fatten animals which are to go on the range again the following summer. Naturally these cattle are not always in the best condition in the spring, though very few of them are particularly poor.

Though cattle are kept at the Salina experiment station primarily for use in the experimental work with stock-poisoning plants, each year there have been a number not used in the experimental feedings.

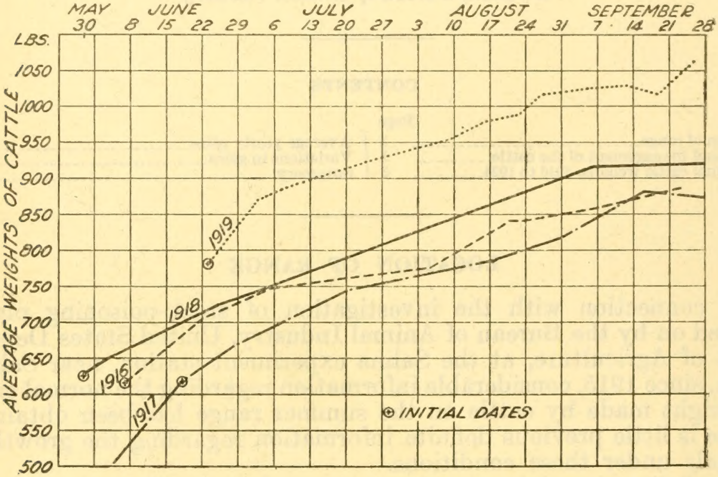

FIG. 1.—Average gains in weight made by cattle kept in pasture at Salina experiment station, Utah, during summers of 1916, 1917, 1918, and 1919

These animals were kept in one of the pastures and not disturbed except to bring them in to the corrals at intervals to weigh them. During the first years these weighings were not made at stated intervals; but, in 1919 and the following summers, attempts were made to weigh them on Saturday of each week. This has been accomplished with fair success. Inability to find certain animals at times and the fact that some have broken out of the pastures at intervals have interfered somewhat with the regularity of the weighings, but have in no way affected the general results.

In the average season, at the Salina experiment station, some snow remains until about the first of June; it is fully as late as that before the vegetation starts. The cattle are, therefore, obtained as soon as the pastures can furnish them with forage. By the end of September, vegetation has been killed by the frosts and has largely dried up. Governed by the season, the station at Salina is usually opened the first of June and closed the first of October.

INDIVIDUAL CATTLE WEIGHTS, 1916 TO 1924

During the nine years for which weight records were kept (1916 to 1924, inclusive) 108 normal cattle were weighed at frequent intervals and were kept under conditions closely comparable to those on the range. The number of these animals in different years varied between 3 in 1919 and 22 in 1923. In Tables 1 to 9 the weights of the animals at the different weighing periods are given, together with the averages of all animals for each date on which they were weighed. The weights given in these tables furnish the facts on which the subsequent tables, figures, and statements are based. The general averages for each weighing period are shown graphically in Figures 1, 2, and 3.

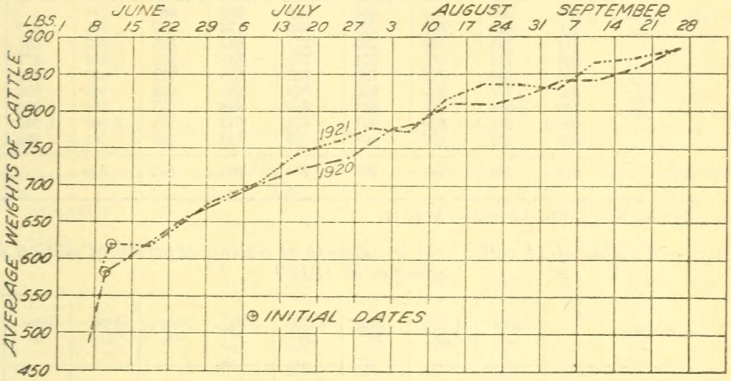

FIG. 2.—Average gains in weight made by cattle kept in pasture at Salina experiment station, Utah, during summers of 1920 and 1921

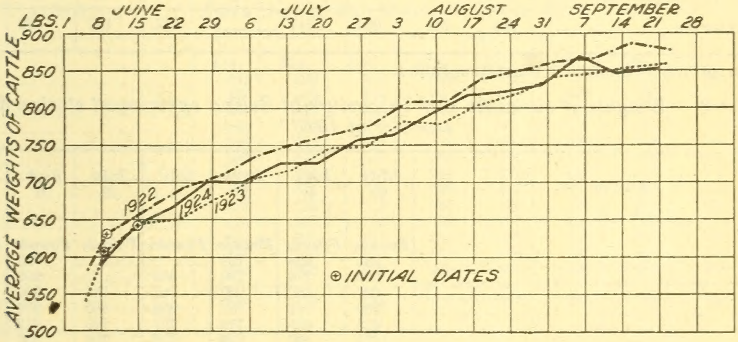

FIG. 3.—Average gains in weight made by cattle kept in pasture at Salina experiment station, Utah, during summers of 1922, 1923, and 1924

TABLE 1.—*Weights of nine cattle kept in pasture at Salina experiment station during summer of 1916* [1]

Animal No.	June 7	June 22	July 5	July 18	Aug. 5	Aug. 21	Aug. 24	Sept. 7	Sept. 12	Sept. 23
	Pounds	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Pounds*
707	456	528	566	584	616	684	680	714	--------	748
708	540	629	678	722	680	758	772	798	817	804
709	674	746	780	770	771	842	825	842	881	870
710	600	714	760	754	770	845	825	844	877	875
711	616	686	715	720	752	804	778	805	852	830
716	686	776	832	820	863	908	944	946	970	976
717	750	844	885	884	939	988	977	989	1,036	1,032
718	696	818	850	904	873	972	976	1,000	1,045	1,030
719	525	597	660	668	709	764	789	791	830	821
Average	616	704	747	758	775	841	841	859	--------	887

[1] The cattle were brought to the station May 17.

TABLE 2.—*Weights of 11 cattle kept in pasture at Salina experiment station during summer of 1917* [1]

Animal No.	June 5	June 19	June 28	July 20	Aug. 1	Aug. 18	Aug. 31	Sept. 16	Sept. 28
	Pounds	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Pounds*
745	460	580	612	678	696	710	747	815	834
746	606	740	780	874	876	880	905	980	936
747	578	722	783	876	899	920	938	982	988
748	516	592	653	726	743	746	774	835	840
749	530	586	632	736	770	804	816	904	906
752	685	818	868	942	--------	994	1,030	1,104	1,087
753	294	342	384	450	--------	500	561	574	584
754	448	556	592	662	696	707	738	813	766
762	533	680	750	824	868	890	914	994	1,016
767	614	782	842	910	926	940	969	1,050	1,030
768	300	399	434	508	526	550	599	650	615
Average	506	618	666	744	--------	786	817	882	873

[1] The cattle were brought to the station June 4.

TABLE 3.—*Weights of six cattle kept in pasture at Salina experiment station during summer of 1918* [1]

Animal No.	May 30	June 4	June 25	July 11	July 26	Sept. 6	Sept. 29
	Pounds	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Pounds*
753	581	603	704	--------	--------	920	893
758	696	716	799	800	--------	958	969
765	630	660	709	747	786	900	934
771	700	734	787	826	860	976	992
809	624	635	716	756	798	912	905
810	525	560	624	678	700	830	830
Average	626	651	723	--------	--------	916	920.5

[1] The cattle were brought to the station May 27.

TABLE 4.—*Weights of three cattle kept in pasture at Salina experiment station during summer of 1919* [1]

Animal No.	June 23	July 3	July 8	July 25	Aug. 4	Aug. 9	Aug. 16	Aug. 23	Aug. 27	Sept. 6	Sept. 13	Sept. 19	Sept. 26
	Lbs.	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*
833	792	923	944	986	992	1,002	1,044	1,060	1,082	1,076	1,080	1,089	1,120
846	793	870	890	922	950	954	968	990	1,008	1,026	1,010	1,003	1,054
847	757	818	825	863	------	896	918	918	956	974	998	966	1,017
Average	781	870	886	924	------	951	977	989	1,015	1,025	1,029	1,019	1,064

[1] The cattle were picked up on the range and delivered to the station June 22 and 23.

TABLE 5.—*Weights of eight cattle kept in pasture at Salina experiment station during summer of 1920* [1]

Animal No.	June 7	June 10	June 14	June 26	July 2	July 10	July 17	July 26	Aug. 3	Aug. 7
	Lbs.	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*
858	566	670	703	771	--------	834	837	868	944	934
860	497	582	614	665	648	714	744	740	802	795
862	469	564	580	625	632	672	686	682	694	744
864	420	510	530	576	572	620	644	644	680	700
866	490	584	580	667	--------	690	708	750	777	755
869	450	542	550	611	618	652	670	692	711	710
871	503	596	607	671	680	724	742	750	800	800
876	503	605	619	672	658	728	744	760	800	809
Average	487	582	598	657	--------	704	722	736	776	781

Animal No.	Aug. 8, 11 a. m.	Aug. 8, 1 p. m.	Aug. 14	Aug. 22	Aug. 29	Sept. 4	Sept. 10	Sept. 18	Sept. 26
	Lbs.	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*
858	843	888	952	950	948	994	984	880	1,024
860	756	766	836	860	898	895	888	920	963
862	680	698	755	750	764	778	790	814	805
864	626	628	716	708	728	740	746	786	786
866	691	689	804	794	816	828	828	866	864
869	656	698	756	755	782	788	788	818	832
871	752	766	820	828	822	853	848	884	900
876	764	752	840	825	830	854	864	896	908
Average	721	736	810	809	823.5	841	842	858	885

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[1] The cattle were brought to the station June 7.

TABLE 6.—*Weights of 13 cattle kept in pasture at Salina experiment station during summer of 1921* [1]

Animal No.	June 9	June 11	June 18	June 25	June 30	July 9	July 16	July 23	July 30
	Lbs.	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*
861	591	622	643	680	699	722	768	808	816
867	479	522	524	561	671	619	660	685	694
870	584	623	605	650	673	714	766	790	798
872	548	572	595	624	631	661	692	724	724
899	548	565	524	570	590	628	668	676	698
904	502	536	542	580	571	617	658	666	686
907	714	750	748	797	821	840	883	896	920
908	457	514	510	524	548	588	600	616	632
912	676	722	725	755	770	824	844	856	882
913	470	493	490	520	544	558	605	614	650
914	542	583	591	604	638	670	700	730	751
918	578	616	610	639	666	693	750	750	780
919	876	921	923	959	986	1,000	1,046	1,054	1,052
Average	581	618	618	651	677	703	741	759	776

Animal No.	Aug. 6	Aug. 13	Aug. 20	Aug. 27	Sept. 3	Sept. 10	Sept. 17	Sept. 24
	Lbs.	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*
861	809	846	878	881	886	909	901	932
867	682	739	750	756	756	780	782	800
870	808	858	868	899	870	916	910	927
872	728	788	815	802	775	852	835	858
899	690	731	764	779	762	795	812	808
904	679	734	752	741	734	799	823	825
907	947	956	994	960	964	973	1,008	1,000
908	621	664	684	677	679	705	699	718
912	870	916	938	969	928	965	965	928
913	633	676	696	691	693	727	729	734
914	737	767	791	804	796	833	822	824
918	765	825	832	821	844	860	896	900
919	1,055	1,092	1,124	1,106	1,107	1,141	1,156	1,156
Average	771	815	837	837	830	866	872	878

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[1] The cattle were brought to the station June 7. None of these animals were used for experimental work during the summer of 1921, but some had been used in 1920.

TABLE 7.—*Weights of 20 cattle kept in pasture at Salina experiment station during summer of 1922* [1]

Animal No.	June 6	June 10	June 17	June 24	July 1	July 8	July 15	July 22	July 29
	Lbs.	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*
927	540	586	604	620	644	665	680	682	680
931	510	560	598	608	620	642	672	664	667
933	560	610	640	656	683	712	715	730	758
934	542	585	602	639	639	665	678	701	704
941	614	676	702	742	762	788	810	799	825
942	594	636	667	700	721	726	746	764	780
943	706	756	798	817	838	883	882	904	936
944	642	693	718	725	788	800	818	833	842
947	608	668	714	743	746	797	800	813	834
948	604	658	662	706	712	732	740	750	770
949	540	624	660	686	690	729	733	761	762
950	592	624	665	690	704	716	732	756	762
952	500	552	578	618	624	649	680	692	698
953	636	686	730	772	770	806	806	844	853
955	622	678	714	740	762	806	822	838	840
956	578	620	652	677	676	722	726	744	758
957	560	598	652	663	678	728	734	750	762
958	564	638	658	706	736	740	770	766	779
959	544	606	648	685	679	713	758	767	773
960	580	619	650	664	687	728	732	736	766
Average	581	634	666	693	708	737	752	765	777

Animal No.	Aug. 5	Aug. 12	Aug. 19	Aug. 26	Sept. 1	Sept. 9	Sept. 16	Sept. 23
	Lbs.	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*
927	710	705	740	751	774	796	797	787
931	722	710	724	742	768	764	798	770
933	766	792	817	805	849	844	858	870
934	732	732	799	775	804	810	838	824
941	844	854	888	924	903	908	914	918
942	824	808	846	830	859	880	892	883
943	960	962	1,003	1,051	1,019	1,060	1,058	1,085
944	880	868	900	906	918	904	945	938
947	834	850	877	870	890	824	917	900
948	778	785	817	816	832	832	864	834
949	828	804	818	845	856	878	872	859
950	782	785	814	816	840	864	850	870
952	733	748	760	767	780	794	800	797
953	918	882	924	960	950	954	978	960
955	852	875	906	918	929	930	956	930
956	762	789	814	822	843	821	844	834
957	820	804	842	864	847	844	878	871
958	816	830	836	836	878	888	874	883
959	796	820	838	840	849	860	895	886
960	812	780	822	862	855	880	868	852
Average	808	809	839	850	862	867	885	878

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[1] The cattle were brought to the station June 6.

TABLE 8.—*Weights of 22 cattle kept in pasture at Salina experiment station during summer of 1923* [1]

Animal No.	June 5	June 9	June 16	June 23	June 30	July 7	July 14	July 21	July 28
	Lbs.	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*
937	614	662	703	696	722	746	756	804	798
940	532	572	631	644	660	693	724	734	760
946	632	698	759	720	765	786	850	845	857
963	620	646	688	697	722	772	760	786	782
966	540	610	645	666	686	722	768	762	762
967	580	617	659	662	700	714	734	740	760
972	544	648	695	685	716	763	790	795	790
973	500	552	593	593	624	646	644	696	683
975	464	530	550	564	593	622	624	662	684
976	442	500	533	533	570	590	615	638	640
977	612	663	705	720	742	750	760	784	798
978	576	650	685	695	700	708	740	754	772
979	510	600	625	652	674	704	720	745	732
980	450	538	568	582	616	630	646	684	704
981	432	500	520	531	557	596	590	606	620
985	446	508	553	557	590	583	620	612	618
986	528	606	645	662	688	710	750	760	772
988	700	788	856	834	875	906	922	978	928
989	623	678	707	712	744	776	772	764	792
991	465	503	541	549	562	596	600	624	620
992	484	576	589	612	644	680	697	720	730
993	616	700	740	746	774	814	815	898	865
Average	541	607	645	651	678	705	723	745	748.5

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[1] The cattle were brought to the station June 5.

TALBE 8.—*Weights of 22 cattle kept in pasture at Salina experiment station during summer of 1923*—Continued

Animal No.	Aug. 4	Aug. 11	Aug. 18	Aug. 25	Sept. 1	Sept. 8	Sept. 15	Sept. 22
	Lbs.	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*
937	818	826	832	850	870	887	872	884
940	780	774	810	840	840	854	853	854
946	868	896	906	918	925	938	943	972
963	848	840	857	894	918	894	940	900
966	794	782	824	846	852	868	879	880
967	778	813	825	800	845	844	850	861
972	842	825	868	884	906	918	935	930
973	722	710	726	766	780	796	817	796
975	690	738	713	738	774	772	771	780
976	658	661	681	700	725	732	747	758
977	826	815	850	882	888	892	877	898
978	790	786	856	830	858	876	905	886
979	779	772	808	810	834	823	826	852
980	726	720	752	760	780	786	808	792
981	664	648	690	700	730	727	712	744
985	672	635	679	686	708	699	704	681
986	804	782	820	848	874	889	893	911
988	1,000	942	986	984	1,048	1,040	1,026	1,052
989	817	800	832	852	868	860	854	877
991	658	648	670	690	702	700	700	726
992	750	756	782	790	804	812	819	822
993	900	894	918	946	970	990	983	1,000
Average	781	776	804	819	841	845	851	858

TABLE 9.—*Weights of 16 cattle kept in pasture at Salina experiment station during summer of 1924* [1]

Animal No.	June 8	June 14	June 21	June 28	July 5	July 12	July 19	July 26	Aug. 2	Aug. 9	Aug. 16	Aug. 23	Aug. 30	Sept. 6	Sept. 13	Sept. 21
	Lbs.	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*
999	718	756	772	838	825	830	862	874	886	902	923	946	970	986	986	946
1000	710	740	790	842	838	866	872	914	924	962	994	980	982	1,024	1,012	1,045
1001	600	654	678	704	716	714	736	770	784	805	830	830	862	868	879	836
1002	650	670	706	760	730	770	766	800	814	842	883	856	874	916	905	916
1004	500	554	584	606	576	626	620	665	662	713	724	732	734	794	771	768
1009	604	658	670	690	694	730	704	740	730	744	779	808	782	820	834	818
1012	622	686	708	742	752	761	766	804	806	842	852	866	862	912	864	869
1013	610	644	674	694	710	714	738	760	761	800	806	809	816	856	838	852
1015	610	644	700	748	728	764	747	767	765	794	837	818	842	854	828	868
1018	580	640	670	693	690	697	725	758	736	802	810	833	818	890	838	870
1019	500	510	552	578	580	624	605	642	650	674	694	696	798	742	728	733
1020	630	698	710	754	742	780	763	812	794	844	880	874	876	910	868	876
1021	490	540	544	563	584	618	616	645	696	708	731	724	742	758	762	770
1030	470	540	562	598	605	641	616	648	670	712	720	723	705	776	733	758
1033	585	658	650	700	696	713	720	742	736	778	806	812	805	850	851	835
1034	600	650	686	712	716	729	740	760	772	800	806	826	828	865	842	867
Average	592	640	666	701	699	724	725	756	762	795	817	821	831	864	846	852

[1] The cattle were brought to the station June 8.

AVERAGE YEARLY GAINS

The gains during the entire season are shown better in Table 10, in which the averages for the different years are given. This table shows the initial and final weights for each year, together with the dates of these weighings and the gains made, both in pounds and per cent of the initial weight. It also shows the number of days between the initial and final weighings and the average daily gains.

In comparing Table 10 with Tables 1 to 9, it will be noticed that the first weights, except in 1916, 1918, and 1919, are not taken as the initial weights in computing the season's gains. This is because in the other years the first weights were made after the cattle had been driven nearly 20 miles and in some instances had been corralled overnight. In such cases the weighings after the cattle had been on good feed for a few days were used as the initial weights.

TABLE 10.—*Summary showing gains annually made by cattle in pasture at Salina experiment station, 1916 to 1924, inclusive* [1]

Year	Animals weighed	Initial weights		Final weights		Average increase in weight		Time observed	Average daily gain
		Date	Average	Date	Average				
	Number		*Pounds*		*Pounds*	*Pounds*	*Per cent*	*Days*	*Pounds*
1916	9	June 7	616	Sept. 23	887	271	44	108	2.51
1917	11	June 19	618	Sept. 28	873	255	41.3	101	2.52
1918	6	May 30	626	Sept. 29	920.5	294.5	47	122	2.41
1919	3	June 23	781	Sept. 26	1,064	283	36.2	95	2.98
1920	8	June 10	582	do	885	303	52.1	108	2.81
1921	13	June 11	618	Sept. 24	878	260	42.1	105	2.48
1922	20	June 10	634	Sept. 23	878	244	38.5	105	2.32
1923	22	June 9	607	Sept. 22	858	251	41.3	105	2.39
1924	16	June 14	640	Sept. 21	852	212	33.1	99	2.14

[1] These cattle were not used in experimental feedings.

The average gain for the different seasons is seen to be fairly uniform, varying between 33.1 per cent in 1924 and 52.1 per cent in 1920, and having an average of 41.05 per cent for all animals.

The low average gain in 1924 was made during a very dry season; that of 1919 was for only three animals, all of which were 3 or more years old and were in the pasture only 95 days. The high average of the 1920 group was for five yearlings and three 2-year-olds which had been under observation 108 days.

The average gains, estimated as pounds per animal, in the different years varied between 212 pounds in 1924 and 303 pounds in 1920, with a general average of 255.1 pounds for all animals.

The average daily gains range from 2.14 pounds per animal for 16 animals during 99 days in 1924 to 2.98 pounds per animal for three animals during 95 days in 1919. The average daily gain per head for all animals in all years was 2.43 pounds.

Figure 4 shows the average ratio of gain of all the cattle used in the nine years. In this illustration the length of time the animals had been under observation, rather than dates, was used as the basis for determining gains. This was advisable because the weighings did not start on the same date each year. The date on which the cattle were put into the pasture was more dependent on the advancement of the season than on any other one factor. In working out these gains the week was used as the unit of time and the gains were figured as percentages of initial weights.

In the nine years the weights of 108 cattle were obtained. These weighings continued in all the years for at least 13 weeks. The 1919 group consisting of three animals was not continued for 14 weeks, and so only 105 animals are included in this average. Similarly the 11 animals of the 1917 group and the 16 animals of the 1924 group are not included in the fifteenth week. Stated in another way, for the first 13 weeks the weights of 108 animals are used in computing the percentage gained; in the fourteenth week the weights of 105 animals and in the fifteenth week those of 78 animals were used. The six animals of the 1918 group were continued for 17 weeks, but they were too few in number and were not weighed frequently enough to form the basis for drawing conclusions.

Figure 4 shows that the average gains were rapid early in the season and gradually diminished in rate as the season advanced, but continued on the average until the last weighing in the fall; as a rule about the last week in September. On the basis of this curve one would expect the gains to cease about the middle or last of October.

The curves for the different years as shown in Figures 1 to 3 bring out the same general facts with slight variations, depending probably on a variety of factors.

In Table 11 are shown the variations in the gains made in the different years, in both pounds and per cent. The results for the different years compare very favorably. The animals making the smallest or largest gains in pounds are not necessarily those making the poorest or best gains when figured as percentages of the initial weight. An animal having a small initial weight may make a large percentage gain which does not mean so much in pounds as the smaller percentage gain made by a large animal. The smallest gain in pounds was 160 made by a yearling steer; the poorest showing, when figured as per cent of initial weight, was made by a 3-year-old steer. Both these animals were of the 1924 group.

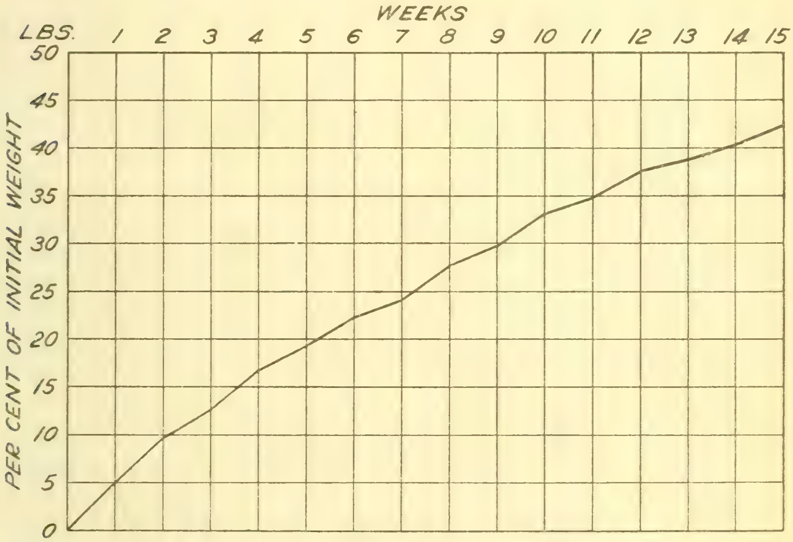

FIG. 4.—Average gains of all cattle used in the nine years, 1916 to 1924, inclusive. The gains are shown as percentages of initial weight

VARIATIONS IN GAINS

The largest gain was 381 pounds made by a 2-year-old steer in 1920, an increase of 65.5 per cent over the original weight. One animal in the 1917 group made a gain of 336 pounds, which was 49.4 per cent of its original weight. Another weighed 342 pounds on June 19 and 584 pounds on September 28, making a gain of 70.8 per cent. The average gains for the different years varied between 212 pounds in 1924 and 303 pounds in 1920. Stated in terms of percentage gains, the variation was from 33.1 per cent in 1924 to 52.1 per cent in 1920. As has been stated elsewhere, the summer of 1924 was very dry; the 1919 animals, which made an average gain of only 36.2 per cent, were under observation only 95 days as against 108 days for the 1920 group and 105 days as a general average for all the animals in the nine years. In addition all the 1919 animals were 3 or more years old and had an average initial weight of 781 pounds.

TABLE 11.—*Minimum, maximum, and average gains 1916 to 1924*

Year	Minimum gain		Maximum gain		Average gain	
	Pounds	*Per cent*	*Pounds*	*Per cent*	*Pounds*	*Per cent*
1916	196	29.1	334	64	271	44
1917	196	26.5	336	70.8	255	41.3
1918	273	39.2	312	58.1	294.5	47
1919	260	32.9	328	41.4	283	36.2
1920	241	42.7	381	65.5	303	52.1
1921	204	25.5	310	53.9	260	42.1
1922	176	26.7	329	46.2	244	38.5
1923	173	29.3	305	51.6	251	41.3
1924	160	24.3	305	43.7	212	33.1

The cattle are roughly classified as yearlings, 2 years old, and 3 or more years old. This classification is not exact, but it may serve as a basis for arriving at some idea of the influence of age on growth under the prevailing conditions. In Table 12 such a division has been made and the yearly averages for each group in the different years is shown. In this table the averages in pounds and per cent are shown, together with the number of animals in each class.

TABLE 12.—*Gains according to age*

Year	Yearlings			2 years old			3 or more years old		
	Animals	Average gain		Animals	Average gain		Animals	Average gain	
		Pounds	*Per ct.*		*Pounds*	*Per ct.*		*Pounds*	*Per ct.*
1916	5	248.0	43.0	3	307.0	48.3	1	282	37.6
1917	2	229.0	61.8	9	261.0	38.8			
1918				5	297.2	47.4	1	281	45.0
1919							3	283	36.2
1920	5	294.0	52.8	3	320.0	51.3			
1921	2	222.5	44.1	10	269.1	44.1	1	235	25.5
1922	9	242.7	39.9	11	254.0	39.3			
1923	5	244.0	46.5	16	252.0	40.6	1	264	33.5
1924				12	211.25	34.8	4	212	29.7
Total	28			69			11		
Averages		250.6	45.8		258.0	40.9		251	33.5

Considering all the animals in each class, the yearlings gained an average of 250.6 pounds, or 45.8 per cent; the 2-year-olds, 258 pounds, or 40.9 per cent; and the older group gained an average of 251 pounds, or 33.5 per cent. In other words, although the older animals gained about the same in pounds as the younger ones, the gain in per cent was considerably less. To put this in another way, two 500-pound animals made much more growth in a season than one 1,000-pound animal.

In the growth curves for the different years, shown in Figures 1, 2, and 3, there are several irregularities in which the rate of increase for a given week is greater or less than that expected from the general trend of the curve. This is well shown in the curve for 1923. The first portion of this curve, from June 5 to 9, shows the very rapid gain of 66 pounds in four days. The animals had been held in a corral the night of June 4 and driven 20 miles the next day before being weighed. In this case the weights of June 9 were taken as initial weights. During the week of July 21 to 28 an average gain of only 3.5 pounds was made, and between August 4 and 11 the cattle lost weight. In each case, however, the gains during the following week were greater than the average. Perhaps such inequalities in a curve are to be expected when so few animals are used. Several factors may influence the weights at a given time, such as weather conditions, the time of day they are weighed, whether they have been near the watering places or on the ridges just before being weighed, and the length of time they have stood in the corral before being weighed. The last two factors are probably the most important.

It was customary to collect all the cattle in the corral before starting weighing. When they were scattered over the pasture, it meant that some animals stood in the corral three or four hours before the others were found, which allowed a considerable shrinkage in weight. The loss in weight or shrinkage is brought out in the table of weights for 1920. On August 7 of that year eight head were brought in and found to have an average weight of 781 pounds. They were left in the corral without feed or water until 11 a. m. August 8, when the weight had fallen to 721 pounds, or a loss of about 60 pounds per animal. They were then allowed to run about two hours in a corral where there was water, when the average weight was found to be 15 pounds more, or 736 pounds. This average gain was made in spite of the fact that apparently two of the animals did not drink. The shrinkage overnight varied between 39 and 91 pounds, the largest loss being 9.7 per cent of the weight of the animal when it was brought in from the pasture. The average shrinkage of all the cases was 7.6 per cent.

During the two hours in the watering corral the changes in weights varied between a loss of 12 pounds and a gain of 45 pounds. Although it is not probable that these are the only causes of the irregularities in the curves, they may well be important factors and at least serve to illustrate the importance of the greatest possible uniformity in the conditions under which weighings are made for comparative purposes.

SUMMARY

Data obtained at the Salina experiment station on the normal gains made by cattle during the summer months under range conditions show, in brief, that:

The average gain of 108 animals for the season was found to be 255.1 pounds, or 41.05 per cent, and the average daily increase was 2.43 pounds.

The rate of gain was most rapid in the early part of the season and gradually slowed down in the fall.

Young animals made larger gains than the older ones, when figured as a percentage of the initial weight, though the gains were about the same in pounds.

ORGANIZATION OF THE UNITED STATES DEPARTMENT OF AGRICULTURE

January 8, 1926

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